

(19) 日本国特許庁 (J P)

(12) 公 開 特 許 公 報 (A)

(11) 特許出願公開番号

特開2002-283482

(P2002-283482A)

(43) 公開日 平成14年10月3日 (2002. 10. 3)

(51) Int.Cl. <sup>7</sup>	識別記号	F I	テ-マ-コ-ト*(参考)
B 3 2 B 5/18	1 0 3	B 3 2 B 5/18	3 D 0 2 3
27/00		27/00	1 0 3 4 F 1 0 0
B 6 0 R 13/02		B 6 0 R 13/02	A
13/08		13/08	

審査請求 未請求 請求項の数4 O L (全 9 頁)

(21) 出願番号 特願2001-91140 (P2001-91140)

(22) 出願日 平成13年3月27日 (2001. 3. 27)

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(54) 【発明の名称】 自動車内装材

(57) 【要約】

【課題】 軽量性、断熱性、成形加工性、耐熱性などの自動車内装材としての特性を保持させつつ、乗員の快適性を向上させるために、車内騒音を低減出来る自動車内装材を提供することを目的とする。

【解決手段】 これまで吸音性能の付与は困難と考えられていた非通気性の独立気泡系発泡積層シートにおいて、発泡層を高発泡化させることで、発泡層に積層された非発泡層の振動の自由度を高め、非発泡層の振動による音の干渉効果を利用することで吸音性能を付与し、非通気性と吸音性能を両立させる。

## 【特許請求の範囲】

【請求項1】 表皮材(1)と発泡積層体(2)からなる自動車内装材において、発泡積層体(2)が変性ポリフェニレンエーテル系樹脂を基材樹脂とする発泡層

(3)の両面に、熱可塑性樹脂からなる非発泡層(4、5)を積層した構造を有し、且つ発泡層(3)の発泡倍率が20倍を超え、100倍以下であることを特徴とする自動車内装材。

【請求項2】 発泡層(3)の発泡倍率が25～70倍であることを特徴とする請求項1記載の自動車内装材。

【請求項3】 非発泡層(4)の基材樹脂である熱可塑性樹脂が変性ポリフェニレンエーテル系樹脂であることを特徴とする請求項1または2記載の自動車内装材。

【請求項4】 発泡層(3)の基材樹脂である変性ポリフェニレンエーテル系樹脂中のフェニレンエーテル成分の含有量が35重量%～75重量%であり、スチレン系成分の含有量が65重量%～25重量%であることを特徴とする請求項1、2または3に記載の自動車内装材。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は自動車内装材に関する。さらに詳しくは、乗員の快適性を向上させるために、車内騒音を低減出来る自動車内装材に関する。

## 【0002】

【従来の技術】従来、自動車内装材として、熱可塑性樹脂発泡体を主体とする基材にウレタンフォームを積層したものや、スチレン-無水マレイン酸共重合体の発泡層の上下面にスチレン-無水マレイン酸共重合体の非発泡層を積層した積層シートを所望の形状に成形したものが広く用いられている。それらの自動車内装材は、軽量で断熱性が高く、成形加工性がすぐれているという特徴がある。

【0003】しかしながら、上記のような従来の自動車内装材は、高温に長時間さらされると、耐熱性が不十分であるため、フロント部が自重で垂れ下がったり(ヒートサグ)、変形を生じるなどの問題を発生することがあった。

【0004】そこで、これらの問題を解決するために、無機質のガラス繊維とプラスチックの複合材料をベースとした自動車内装材が使用されるようになってきた。しかし、この複合材料では、耐熱性という品質は維持できるものの、軽量化が図れない上に、ガラス繊維を使用しているため、リサイクル性が悪く、またコスト高になるという問題があった。

【0005】このような問題を解決するため、軽量で耐熱性のある変性ポリフェニレンエーテル系樹脂(以下「変性PPE系樹脂」と記す。)発泡層の両面に、変性PPE系樹脂非発泡層を積層した発泡積層シートを用いた自動車内装材用発泡積層シートが提案されている(実開平4-11162号公報)。また、特開平6-344

483号公報には発泡倍率5～20倍、厚み2～6mm、連続気泡率5～25%、等の諸物性を規定した変性PPE系樹脂発泡層の両面に、変性PPE系樹脂非発泡層を積層した自動車内装材用発泡積層シートが提案されている。これら変性PPE系樹脂を用いた自動車内装材用発泡積層シートは、耐熱性に優れ、軽量であるため、高温下での変形や自重による垂れ下がり等を改善することができるとしている。

【0006】さらに近年、自動車は高級化・高性能化しており、車内の静寂性が求められているが、上記の変性PPE系樹脂発泡積層シートを用いた自動車内装材においては車内の静寂性に深く関係する吸音性能が付与されておらず、吸音性能を付与させるためには、吸音性能が付与された高価な表皮材の使用、ウレタン発泡層などの吸音材を貼り付ける事、等が必要とされ、材料コストや製造コストのアップを引き起こしていた。

【0007】これに対して従来から、吸音性能を備えた自動車内装材としてウレタンフォーム(特開昭63-199182号)、ウレタンフォームと繊維(特開平2-63703号)、短繊維(特開平2-95838号)を使用したものが知られている。これらの吸音性能を備えた自動車内装材においては、基材に音が当たると、その空気振動が基材内部の空洞部分の空気に伝わり、この空洞部分で空気の粘性摩擦が生じ、音のエネルギーの一部が熱エネルギーに変換され、吸音性能が生じる。つまり空気の動きに対する抵抗によって、その振動が減衰され、音が小さくなる効果を利用するものである。なお、この効果を発現させるためには基材は通気性を有する必要がある。しかしながら、通気性を有する基材を使用する場合、車両の室内側から室外側へ空気の流れが生じた際、表皮層がフィルターの役割を担い表皮層上部が孔状に汚れるため問題となっていた。

## 【0008】

【課題を解決するための手段】本発明者らは、上記問題を解決すべく鋭意研究の結果、これまで吸音性能の付与は困難と考えられていた非通気性の独立気泡系発泡積層シートにおいて、発泡層を高発泡化させることで、発泡層に積層された非発泡層の振動の自由度を高め、非発泡層の振動による音の干渉効果を利用することで吸音性能を付与できることを見出し本発明を完成するに至った。

【0009】すなわち、本発明は、[1]表皮材(1)と発泡積層体(2)からなる自動車内装材において、発泡積層体(2)が変性ポリフェニレンエーテル系樹脂を基材樹脂とする発泡層(3)の両面に、熱可塑性樹脂からなる非発泡層(4、5)を積層した構造を有し、且つ発泡層(3)の発泡倍率が20倍を超え100倍以下であることを特徴とする自動車内装材。

[2]発泡層(3)の発泡倍率が25～70倍であることを特徴とする[1]記載の自動車内装材。

[3]非発泡層(4)の基材樹脂である熱可塑性樹脂が

変性ポリフェニレンエーテル系樹脂であることを特徴とする〔1〕または〔2〕記載の自動車内装材。

〔4〕発泡層（3）の基材樹脂である変性ポリフェニレンエーテル系樹脂中のフェニレンエーテル成分の含有量が35重量%～75重量%であり、スチレン系成分の含有量が65重量%～25重量%であることを特徴とする〔1〕～〔3〕のいずれか1記載の自動車内装材。

#### 【0010】

【発明の実施の形態】次に、本発明に係る自動車内装材および自動車内装材用発泡積層シートの例を図面に基いて詳しく説明する。

【0011】図1は、本発明の1実施形態に係る自動車内装材の構成を示すものであり、耐熱性樹脂を基材樹脂とする発泡層（3）の両面に、熱可塑性樹脂を基材樹脂とする非発泡層（車内側非発泡層（4）および車外側非発泡層（5））が形成されてなり、車内側非発泡層

（4）の上面にホットメルト接着剤層（6）を介して表皮材（1）が積層されている。

【0012】耐熱性樹脂を基材樹脂とする発泡層（3）は自動車内装材の基体となる層であり、この層（3）が耐熱性および成形性が良好な樹脂からなるので、2次発泡積層成形体である自動車内装材が容易に成形できる。また、この層（3）が発泡層であるため、軽量で、断熱性に優れ、また密度が低いため使用樹脂量が少量で済み、コスト競争力を有するものとなる。

【0013】本発明の発泡層（3）の基材樹脂として使用される耐熱性樹脂は、耐熱性を有するとして当業者に知られるいずれの樹脂をも用いることができる。例示すれば、スチレン-アクリル酸共重合体、スチレン-無水マレイン酸共重合体、スチレン-イタコン酸共重合体等の耐熱ポリスチレン系樹脂；ポリスチレンあるいは耐熱ポリスチレンとポリフェニレンエーテル（PPE）とのブレンド体、PPEへのスチレングラフト重合物などのスチレン・フェニレンエーテル共重合体、等の変性ポリフェニレンエーテル系樹脂（変性PPE系樹脂）；ポリカーボネート樹脂；およびポリブチレンテレフタレートやポリエチレンテレフタレートで例示されるポリエステル樹脂などである。これらの樹脂は、2種以上を用いることもできる。この中でも、変性PPE系樹脂を発泡シートの基材樹脂として使用すると、耐熱性および剛性等の品質に優れているうえに、加工性および製造が容易である点で好ましい。

【0014】変成PPE系樹脂に使われるPPE系樹脂としては、例えば、ポリ（2，6-ジメチルフェニレン-1，4-エーテル）、ポリ（2-メチル-6-エチルフェニレン-4-エーテル）、ポリ（2，6-ジエチルフェニレン-1，4-エーテル）、ポリ（2，6-ジエチルフェニレン-1，4-エーテル）、ポリ（2-メチル-6-n-プロピルフェニレン-1，4-エーテル）、ポリ（2-メチル-6-n-ブチルフェニレン-

1，4-エーテル）、ポリ（2-メチル-6-クロロフェニレン-1，4-エーテル）、ポリ（2-メチル-6-ブROMフェニレン-1，4-エーテル）、ポリ（2-エチル-6-クロロフェニレン-1，4-エーテル）等が挙げられ、これらは単独又は2種以上組み合わせて用いられる。

【0015】変性PPE系樹脂中、PPE系樹脂と混合樹脂を形成するPS系樹脂はスチレンまたはその誘導体、例えば $\alpha$ -メチルスチレン、2，4-ジメチルスチレン、モノクロルスチレン、ジクロルスチレン、p-メチルスチレン、エチルスチレン等を主成分とする樹脂である。したがって、PS系樹脂はスチレンまたはスチレン誘導体だけからなる単独重合体に限らず他の単量体と共重合することによって作られた共重合体であってもよい。

【0016】また、前記PPE系樹脂に重合、好ましくはグラフト重合させるスチレン系単量体の具体例としては、たとえばスチレン、 $\alpha$ -メチルスチレン、2，4-ジメチルスチレン、モノクロルスチレン、ジクロルスチレン、p-メチルスチレン、エチルスチレンなどがあげられる。これらは単独で用いてもよく、2種以上組み合わせてもよい。これらのうちではスチレンが、汎用性、コストの点から好ましい。

【0017】本発明の発泡層に使用される基材樹脂として、変成PPE系樹脂を使用する場合は、フェニレンエーテル成分として35～75重量部、スチレン成分として65～25重量部が好ましく、更に好ましくは、フェニレンエーテル成分として35～60重量部、スチレン成分として65～40重量部、特に好ましくは、フェニレンエーテル成分として38～58重量部、スチレン成分として62～42重量部がよい。PPE系樹脂の混合割合が少ないと、耐熱性が劣る傾向にあり、PPE系樹脂の混合割合が多いと、加熱流動時の粘度が上昇し発泡成形が困難になる傾向がある。

【0018】変性PPE系樹脂発泡層は、厚みが3～20mm、更には4～10mmであるのが好ましい。発泡層の厚さが3mm未満であると、強度および断熱性に劣り自動車内装材として適当でない場合がある。一方、20mmを超える場合、自動車室内のスペースの確保、室内設計上の制限等の理由から実用上不適當である場合がある。

【0019】変性PPE系樹脂発泡層は発泡倍率が20倍を超え100倍以下、更には25～70倍であるのが好ましく。最も好ましくは30～60倍である。これは、本発明における自動車内装材は、発泡層の倍率を上げることによりばね乗数を低減させ、発泡層に積層された非発泡層の振動による音の干渉効果を利用するものであり、発泡倍率が20倍以下の場合ばね定数低減の効果が十分ではなく、吸音性能は向上しない傾向がある。また、発泡倍率が100倍を超える場合は、セル膜密度が

低くなり過ぎて耐熱性が悪化する傾向がある。

【0020】変性PPE発泡層は独立気泡率が70%以上、更には80%以上が好ましい。独立気泡率が70%未満の場合、断熱性、剛性に劣る傾向がある。

【0021】本発明において使用される発泡層(3)の基材樹脂には、必要に応じて気泡調整剤、耐衝撃性改良剤、滑剤、酸化防止剤、静電防止剤、顔料、安定剤、臭気低減剤等を添加してもよい。

【0022】次に、本発明に係る自動車内装材には、耐熱性樹脂発泡層(3)の両面に熱可塑性樹脂の非発泡層(4, 5)が形成される。これら非発泡層(4, 5)のうち、車内側非発泡層(4)は、その一方の表面に積層される表皮材(1)の加熱収縮を抑制する働きと、他方の表面にある発泡層(3)が成形時に延伸され扁平となったセルが加熱時に扁平率を解消する方向に形状を変化させることによる加熱収縮を抑制する働きを有する。また、車外側非発泡層(5)は発泡層(3)の加熱収縮を抑制する働きを有する。

【0023】ここで発泡層(3)の加熱収縮率はセル形状、養生によるセル内圧の変化、独立気泡率、加熱温度等により大きく影響され、その収縮率を制御することは非常に困難である。しかしながら、高温下でのフロント部の変形は発泡層(3)の加熱収縮率に大きく左右されるため、発泡層(3)の加熱収縮率を発泡層(3)の両面に積層された非発泡層(4, 5)で抑制することが重要となる。

【0024】次に、非発泡層(4, 5)に用いられる熱可塑性樹脂としては、耐熱PS系樹脂、変性PPE系樹脂、ポリプロピレン系樹脂、ポリエチレンテレフタレート(PET)系樹脂、ポリアミド(ナイロン)系樹脂などが挙げられ、これらは単独で、または2種以上組み合わせて用いられるが、発泡層(3)として変性PPE系樹脂を使用する場合は、該樹脂層との接着性の観点から、変性PPE系樹脂、耐熱PS系樹脂が好ましく使用される。

【0025】非発泡層(4, 5)として変性PPE系樹脂を使う場合は、上述の発泡層(3)の場合と同様に、PPE系樹脂とスチレン系化合物を主体とする単量体またはその重合体で重合または混合による変性を行ったものであり、例えば、PPE系樹脂とPS系樹脂との混合樹脂、PPE系樹脂にスチレン系単量体を重合させたPPE-スチレン共重合体、この共重合体とPS系樹脂またはPPE系樹脂との混合物、その共重合体とPPE系樹脂とPS系樹脂との混合物などが挙げられる。これらのうちでは、PPE系樹脂とPS系樹脂との混合樹脂が、製造が容易であるなどの点から好ましい。

【0026】これらPPE系樹脂、PS系樹脂またはスチレン系単量体の具体例や好ましいものの例示や、PS系樹脂やスチレン単量体と重合可能な単量体の具体例、それを使用する理由などは、発泡層3において説明した

場合と同様である。ただし、PS系樹脂の好ましい具体例として、HIPSで代表されるスチレン-ブタジエン共重合体が、非発泡層(4, 5)の耐衝撃性改善効果が大きいという点から追加される。

【0027】非発泡層(4, 5)に使用される基材樹脂として、変性PPE系樹脂を使用する場合は、フェニレンエーテル成分として15~75重量部、スチレン成分として75~25重量部が好ましく、更に好ましくは、フェニレンエーテル成分として20~60重量部、スチレン成分として80~40重量部がよい。PPE系樹脂の使用割合が小さすぎると、耐熱性が劣る傾向にあり、PPE系樹脂の使用割合が大きすぎると、加熱流動時の粘度が上昇し、成形が困難になる場合がある。

【0028】非発泡層(4, 5)の基材樹脂として好ましい耐熱PS系樹脂はスチレンまたはその誘導体と他の単量体との共重合体(以下「St系共重合体」と記す。)であり、耐熱性の改善効果を有するスチレンまたはその誘導体と共重合可能な単量体としては、例えばマレイン酸、フマル酸、アクリル酸、メタアクリル酸、イタコン酸などの不飽和カルボン酸またはその誘導体およびその酸無水物、アクリロニトリル、メタアクリロニトリルなどのニトリル化合物またはその誘導体が挙げられる。これらは単独で用いてもよく、2種類以上組み合わせて用いてもよい。耐熱性の改善効果を有するスチレンまたはその誘導体と共重合可能な単量体は通常40重量%以下、好ましくは30重量%以下の範囲で用いられる。

【0029】また、スチレンまたはスチレン誘導体を重合させる際に、合成ゴムまたはゴムラテックスを添加して重合させたものとマレイン酸、フマル酸、アクリル酸、メタアクリル酸、イタコン酸などの不飽和カルボン酸またはその誘導体およびその酸無水物、アクリロニトリル、メタアクリロニトリルなどのニトリル化合物との共重合体であってもよい。このうちでは、スチレン-無水マレイン酸系共重合体、スチレン-アクリル酸系共重合体、スチレン-メタアクリル酸系共重合体、アクリロニトリル-ブタジエン-スチレン共重合体とその耐熱性改善効果、汎用性、コストの面から好ましい。

【0030】耐熱PS系樹脂は単独で用いても良く、あるいは2種類以上組み合わせても良い。また、耐熱PS系樹脂は他の熱可塑性樹脂とブレンドして用いてもよく、ブレンドする熱可塑性樹脂としては例えば、ポリスチレン、HIPS、ポリカーボネート、ポリエステル、ポリエチレンやポリプロピレンなどのポリオレフィン、ポリ塩化ビニルなどの塩化ビニル系樹脂、ポリエーテルエーテルスルホン、ポリスルホン、ポリアミドやそれらの共重合体などがあげられる。このうちでは汎用性、均一分散が可能であること、非発泡層の耐衝撃性改善効果が大きいこと、コストの面等からHIPSが好ましい。HIPSとしては公知のものが使用でき、ゴム成分の含

有量は通常1～15重量%である。

【0031】非発泡層(4、5)の厚みは50～300μmさらには75～200μmが好ましい。非発泡層(4、5)の厚さが50μmより薄い場合には、強度、剛性、耐熱性などが劣り、300μmより厚い場合には、積層シートの成形性が劣る傾向にある。

【0032】また、本発明は高発泡させた発泡層(3)に積層された非発泡層(4、5)の振動による音の干渉効果を利用したもので、非発泡層(4、5)の剛性、および目付けを調整することで共鳴周波数をチューニングし、自動車内装材として必要とされる周波数領域での吸音性能を改善することを可能とするものである。そのため、非発泡層の目付けおよび剛性は、吸音性能を改善したい周波数領域によって任意に設定される。

【0033】さらに、非発泡層(4、5)に共鳴振動ピークをブロード化することを目的に、非発泡層(4、5)にフェルト等の不織布、ポリウレタンフォームやポリエチレン、ポリプロピレンなどのポリオレフィンフォームからなる発泡体、非通気性の樹脂フィルムの間に空気を閉じ込めた構造の緩衝材(エアーキャップ)等を接着剤層を介して積層してもよい。特に、緩衝材(エアーキャップ)を非発泡層(4、5)に積層することは、安価に共鳴振動ピークをブロード化出来るため有効である。

【0034】非発泡層(4、5)を形成する場合、必要に応じて、耐衝撃性改良剤、充填剤、滑剤、酸化防止剤、静電防止剤、顔料、安定剤、臭気低減剤等を単独又は2種以上組み合わせて添加してもよい。

【0035】耐衝撃性改良剤は、非発泡層(4、5)を発泡層(3)に積層し、2次発泡させた積層シートを自動車内装材として成形する際のパンチング加工や、積層シートや成形体を輸送する際に、非発泡層(4、5)の割れなどを防止するのに有効である。耐衝撃性改良剤としては、基材樹脂に混合することによってその効果を発揮するものであれば特に限定なく使用し得る。耐衝撃性\*

	商品名	製造会社	PPE成分 (%)	PS成分 (%)	ゴム成分 (%)	その他
変性PPE樹脂(a)	ノリル EFN4230	日本GE プラスチック㈱	70	30		
PS樹脂(b)	スタイロン GB102	A&M ポリスチレン㈱		100		
SMAA共重合体 樹脂(c)	スタイロン G9001	A&M ポリスチレン㈱		92		メタクリル酸 8
HIPS樹脂(d)	スタイロン H8117	A&M ポリスチレン㈱		87.5	12.5	
耐衝撃性改良剤 (e)	タフブレン 125	A&M ポリスチレン㈱			100	

〔樹脂の種類〕

変性PPE : 変性ポリフェニレンエーテル

PS : ポリスチレン

SMAA共重合体 : スチレン-メタアクリル酸共重合体

HIPS : ハイインパクトポリスチレン

また、実施例および比較例で行った評価方法を以下に示す。

\* 改良剤は、重合による変性で熱可塑性樹脂に導入した耐衝撃性改良効果を発揮し得る成分であってもよく、例えばHIPSなどのように耐衝撃性改良成分を含むものを混合して非発泡層に使用する場合も、非発泡層(4、5)に耐衝撃性を付与することができる。

【0036】発泡積層シートの車内側非発泡層(4)の表面には、ホットメルト接着剤層(6)が形成される。ホットメルト接着剤は、通常、表皮材(1)を成形体に接着するのに用いられる。前記ホットメルト接着剤としては、ポリオレフィン系、変性ポリオレフィン系、ポリウレタン系、エチレン-酢酸ビニル共重合樹脂系、ポリアミド系、ポリエステル系、熱可塑性ゴム系、スチレン-ブタジエン共重合体系、スチレン-イソプレン共重合体系などの樹脂を成分とするものが挙げられる。

【0037】表皮材(1)の具体例としては、従来の自動車内装材として用いられるものが使用できる。たとえば織布、不織布を配するが、これらには、ポリエチレンテレフタレート、ポリプロピレン、ポリアミド(ナイロン)、ポリアクリロニトリル、モダアクリル(例えば、鐘淵化学工業株式会社製「カネカロン(登録商標)」などの合成樹脂や羊毛、木綿などの天然素材のものや、それらを適宜組み合わせたものが使われる。このような表皮材(1)に、必要に応じて、更にポリウレタンフォームやポリエチレン、ポリプロピレンなどのポリオレフィンフォームから成る発泡層を単層または複層で積層したものが使用できる。

【0038】

【実施例】以下に実施例に基づいて本発明を更に詳細に説明するが、本発明はこれにより何ら制限を受けるものではない。実施例・比較例に用いた樹脂を表1に示す。なお表1に示した樹脂に関する各符号は次の通りである。

【0039】

〔表1〕

す。

〔発泡倍率〕自動車内装材の一般部からサンプルを切り出し、各構成層を分離した後、発泡層の密度dfをJISK7222に準じて測定し、変性PPE系樹脂の密度dpをJISK7112に準じて測定し、次式より求めた。

発泡倍率 =  $d_p / d_f$

【0040】〔実装耐熱性試験〕図2に示すような自動車内装材(幅930mm×長さ1424mm)を自動車天井部(カットボディ)に装着し、サンバイザー、ルームミラー、ルームランプ、ガニッシュ、ピラーを介して実車と同等となるように固定した。なお、図中7はアシストグリップ取付穴、8はサンバイザー取付穴、9はサンバイザー留め取付孔、10はルームミラー取付穴、11は室内灯取付穴である。また、フロント部分に測定点を6点、成形体の中心線と対称に120mm間隔で刻印した(図1中a~f)。フロント部の測定点付近に標線を設け垂直方向の距離を測定した。次に、 $100 \pm 1^\circ\text{C}$ に設定した恒温室に、天井材を取り付けた自動車天井部を24時間投入した後、成形体フロント部に刻印された測定点の垂直方向の寸法変化量の絶対値を測定し、a~fの最大値を記録した。なお、表3に記入した最大変位量は、垂直反り上がり方向をプラス(+)、垂直垂れ下がり方向をマイナス(-)として測定した値である。

【0041】判定の基準としては自動車内装材としての実用性を考慮して、以下の基準を用いた。

**耐熱変位量**      ○・・・ $\pm 2.0\text{mm}$ 以下  
                         ×・・・ $\pm 2.0\text{mm}$ 以上

〔吸音性〕自動車内装材の一般部より試験片を切り出し、JIS-A-1405による垂直入射吸音率の測定により評価した。なお、自動車への実装状態に近づける為、背後空気層20mmを設け、音は表皮材側より入射した。

〔通気度〕自動車内装材の一般部より試験片を切り出し、JIS-L-1004による通気量の測定により評価した。判定の基準としては自動車内装材としての実用性を考慮して、以下の基準を用いた。

**通気度**      ○・・・通気度 $0.01\text{cc}/\text{cm}^2\text{sec}$ 以下  
                         ×・・・通気度 $0.01\text{cc}/\text{cm}^2\text{sec}$ 以上

【0042】

【発明の効果】(実施例1)

発泡層：PPE系樹脂成分40重量%、PS系樹脂成分60重量%(変性PPE樹脂(a)72.7部とPS樹脂(b)27.3部を混合)からなる厚み5.8mm、発泡倍率32倍の発泡層

室内側非発泡層：PPE系樹脂成分20重量%、PS系樹脂成分80重量%(変性PPE樹脂(a)28.6部、PS樹脂(b)71.4部を混合)からなる厚み120 $\mu\text{m}$ のフィルム

室外側非発泡層：SMAA共重合体樹脂(c)47.5部とHIPS樹脂(d)47.5部、耐衝撃改良剤(e)5部からなる厚み150 $\mu\text{m}$ のフィルム

表皮材層：PET系不織布表皮材(日本バイリーン社製RVC-100、厚さ約1.0mm)

接着剤層：ホットメルトフィルム(クラボウ(株)社製クランベターX2200)からなる自動車内装材の一般部

から試験片を切り出し、垂直入射吸音率と通気度を測定した。測定結果を図3および表2に示す。さらに自動車内装材をカットボディに装着し、 $100^\circ\text{C}$ 24時間の実装耐熱試験を行った。測定結果を表2に示す。

【0043】(実施例2)

発泡層：PPE系樹脂成分40重量%、PS系樹脂成分60重量%(変性PPE樹脂(a)72.7部とPS樹脂(b)27.3部を混合)からなる厚み5.1mm、発泡倍率34倍の発泡層とし、それ以外は、実施例1と同様な構成の自動車内装材の一般部から試験片を切り出し、垂直入射吸音率と通気度を測定した。測定結果を図3および表2に示す。さらに自動車内装材をカットボディに装着し、 $100^\circ\text{C}$ 24時間の実装耐熱試験を行った。測定結果を表2に示す。

【0044】(実施例3)

発泡層：PPE系樹脂成分40重量%、PS系樹脂成分60重量%(変性PPE樹脂(a)72.7部とPS樹脂(b)27.3部を混合)からなる厚み5.0mm、発泡倍率42倍の発泡層とし、それ以外は、実施例1と同様な構成の自動車内装材の一般部から試験片を切り出し、垂直入射吸音率と通気度を測定した。測定結果を図3および表2に示す。さらに自動車内装材をカットボディに装着し、 $100^\circ\text{C}$ 24時間の実装耐熱試験を行った。測定結果を表2に示す。

【0045】(実施例4)

室外側非発泡層：PPE系樹脂成分20重量%、PS系樹脂成分76.2重量%、ゴム成分3.8%(変性PPE樹脂(a)28.6部、PS樹脂(b)41.4部、HIPS樹脂(d)30部を混合)からなる厚み120 $\mu\text{m}$ のフィルムとし、それ以外は、実施例1と同様な構成の自動車内装材の一般部から試験片を切り出し、垂直入射吸音率と通気度を測定した。測定結果を図4および表2に示す。さらに自動車内装材をカットボディに装着し、 $100^\circ\text{C}$ 24時間の実装耐熱試験を行った。測定結果を表2に示す。

【0046】(実施例5) 室外側スキン層上に緩衝材(酒井化学工業(株)ポリエチレン製気泡緩衝材『ミナパック』)を積層した以外は実施例3と同様な構成の自動車内装材の一般部から試験片を切り出し、垂直入射吸音率と通気度を測定した。測定結果を図4および表2に示す。さらに自動車内装材をカットボディに装着し、 $100^\circ\text{C}$ 24時間の実装耐熱試験を行った。測定結果を表2に示す。

【0047】(比較例1)

発泡層：PPE系樹脂成分40重量%、PS系樹脂成分60重量%(変性PPE樹脂(a)72.7部とPS樹脂(b)27.3部を混合)からなる厚み3.5mm、発泡倍率19倍の発泡層とし、それ以外は、実施例1と同様な構成の自動車内装材の一般部から試験片を切り出し、垂直入射吸音率と通気度を測定した。測定結果を図

5および表2に示す。さらに自動車内装材をカットボディに装着し、100℃24時間の実装耐熱試験を行った。測定結果を表2に示す。

#### 【0048】(比較例2)

発泡層：PPE系樹脂成分40重量％、PS系樹脂成分60重量％(変性PPE樹脂(a)72.7部とPS樹脂(b)27.3部を混合)からなる厚み2.2mm、発泡倍率12倍の発泡層とし、それ以外は、実施例1と同様な構成の自動車内装材の一般部から試験片を切り出し、垂直入射吸音率と通気度を測定した。測定結果を図5および表2に示す。さらに自動車内装材をカットボディに装着し、100℃24時間の実装耐熱試験を行った。測定結果を表2に示す。

#### 【0049】(比較例3)

発泡層：PPE系樹脂成分40重量％、PS系樹脂成分60重量％(変性PPE樹脂(a)72.7部とPS樹脂\*

\* 脂(b)27.3部を混合)からなる厚み1.8mm、発泡倍率15倍の発泡層とし、それ以外は、実施例1と同様な構成の自動車内装材の一般部から試験片を切り出し、垂直入射吸音率と通気度を測定した。測定結果を図3および表2に示す。さらに自動車内装材をカットボディに装着し、100℃24時間の実装耐熱試験を行った。測定結果を表2に示す。

#### 【0050】(比較例4)

発泡層：PPE系樹脂成分20重量％、PS系樹脂成分80重量％(変性PPE樹脂(a)28.6部とPS樹脂(b)71.4部を混合)からなる厚み5.8mm、発泡倍率32倍の発泡層とし、それ以外は、実施例1と同様な構成の自動車内装材をカットボディに装着し、100℃24時間の実装耐熱試験を行った。測定結果を表2に示す。

#### 【表2】

	100℃実装耐熱試験 最大変位量(mm)	判定	通気度	判定	垂直入射吸音率 1~5kHzの平均値
実施例1	-1.5	○	0.0	○	0.16
実施例2	-1.2	○	0.0	○	0.18
実施例3	-0.9	○	0.0	○	0.21
実施例4	0.2	○	0.0	○	0.24
実施例5	-1.1	○	0.0	○	0.24
比較例1	-1.2	○	0.0	○	0.07
比較例2	-1.5	○	0.0	○	0.09
比較例3	-1.3	○	0.0	○	0.05
比較例4	-4.5	x	0.0	○	—

#### 【0051】

【発明の効果】本発明の自動車内装材は、耐熱性が改善され、高温下での使用による変形、自重による垂れ下がり改善されている。しかも、これまで困難とされていた非通気性と優れた吸音性能の両立が達成されている。

#### 【図面の簡単な説明】

【図1】本発明に係る自動車内装材の要部拡大断面説明図である。

【図2】本発明に係るトリミング加工を施した自動車内装材の一例を示す平面説明図である。

【図3】本発明に係る実施例1～3の自動車内装材の背後空気層20mmを設けた垂直入射吸音率の測定結果である。

【図4】本発明に係る実施例4～5の自動車内装材の背後空気層20mmを設けた垂直入射吸音率の測定結果である。

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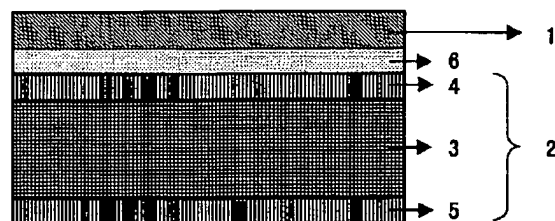
※【図5】本発明に係る比較例1～4の自動車内装材の背後空気層20mmを設けた垂直入射吸音率の測定結果である。

#### 【符号の説明】

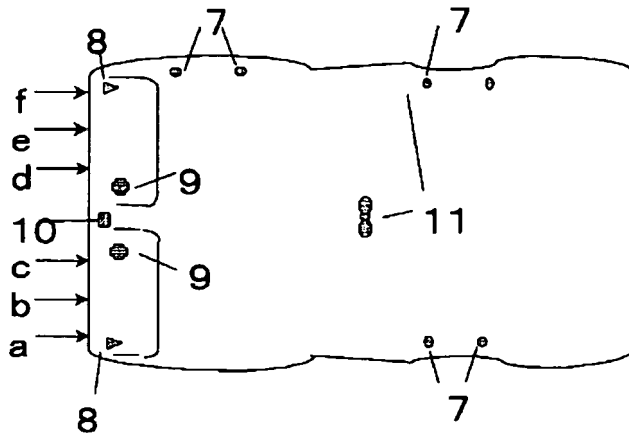
- 1：表皮材
- 2：発泡積層体
- 3：発泡層
- 4：車内側非発泡層
- 5：車外側非発泡層
- 6：ホットメルト接着剤層
- 7：アシストグリップ取付穴
- 8：サンバイザー取付穴
- 9：サンバイザー留め取付穴
- 10：ルームミラー取付穴
- 11：室内灯取付穴

※40

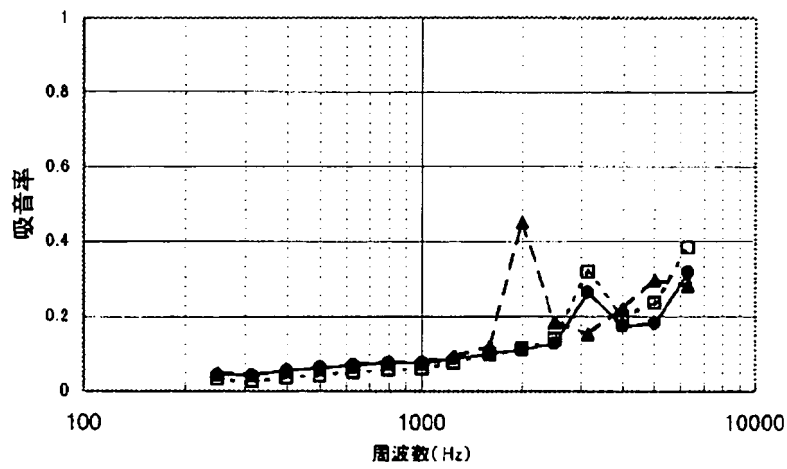
#### 【図1】



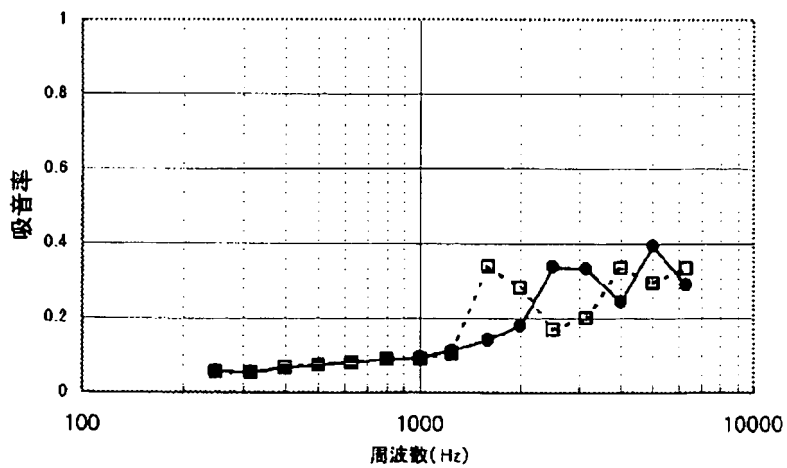
【図2】



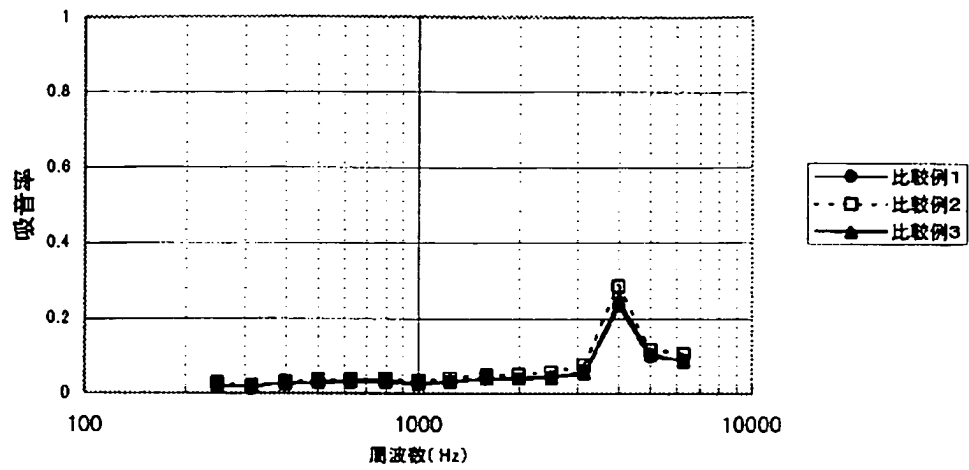
【図3】



【図4】



【図5】



フロントページの続き

F ターム(参考) 3D023 BA03 BA05 BB03 BD01 BE07  
 BE31  
 4F100 AK01C AK01D AK12 AK12B  
 AK12J AK25 AK25J AK42  
 AK54B AK54C AK54D AK54J  
 AL01 AL01B AL06B AL06C  
 AL06D ATOOA BA04 BA07  
 BA10A BA10D BA13 CB03  
 DG15 DJ01B GB33 JB16C  
 JB16D JD02 JH01 JJ02  
 JJ03 JL01 JL03 YY00B

## CLAIMS

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### [Claim(s)]

[Claim 1] Automobile interior material which it has the structure which carried out the laminating of the non-foaming layer (4 5) which becomes both sides of a foaming layer (3) to which a foaming layered product (2) uses denaturation polyphenylene ether system resin as base material resin from thermoplastics in the automobile interior material which consists of epidermis material (1) and a foaming layered product (2), and the expansion ratio of a foaming layer (3) exceeds 20 times, and is characterized by being 100 or less times.

[Claim 2] Automobile interior material according to claim 1 characterized by being 25 to 70 times the expansion ratio of a foaming layer (3) of this.

[Claim 3] Automobile interior material according to claim 1 or 2 characterized by the thermoplastics which is base material resin of a non-foaming layer (4) being denaturation polyphenylene ether system resin.

[Claim 4] Automobile interior material according to claim 1, 2, or 3 characterized by for the content of the phenylene ether component in the denaturation polyphenylene ether system resin which is base material resin of a foaming layer (3) being 35 % of the weight - 75 % of the weight, and the content of a styrene system component being 65 % of the weight - 25 % of the weight.

## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to automobile interior material. in more detail, in order to raise crew's amenity, the noise in the car can be reduced -- automobile interior material Seki is carried out.

[0002]

[Description of the Prior Art] Conventionally, what carried out the laminating of the urethane foam to the base material which makes thermoplastics foam a subject as automobile interior material, and the thing which fabricated the laminating sheet which carried out the laminating of the non-foaming layer of a styrene maleic anhydride copolymer in the vertical side of the foaming layer of a styrene maleic anhydride copolymer in the desired configuration are used widely. Those automobile interior material has the description that it is lightweight, adiathermic is high and fabrication nature is excellent.

[0003] However, when the long duration pan of the above conventional automobile interior material was carried out to the elevated temperature, since thermal resistance was inadequate, the front section might hang down by the self-weight, and problems, such as producing a (heat sag) and deformation, might be generated.

[0004] Then, in order to solve these problems, the automobile interior material which used an inorganic glass fiber and composite material of plastics as the base has come to be used. However, in this composite material, although the quality of thermal resistance is maintainable, since lightweight-ization was not able to be attained upwards and the glass fiber was used, there was a problem that recycle nature was bad and became cost quantity.

[0005] In order to solve such a problem, the foaming laminating sheet for automobile interior material using the foaming laminating sheet which carried out the laminating of the denaturation PPE system resin non-foaming layer to both sides of the denaturation polyphenylene ether system resin (it is described as "denaturation PPE system resin" below.) foaming layer which is lightweight and has thermal resistance is proposed (JP,4-11162,U). Moreover, the foaming laminating sheet for automobile interior material which carried out the laminating of the denaturation PPE system resin non-foaming layer to both sides of the denaturation PPE system resin foaming layer which specified many physical properties, such as expansion ratio of 5-20 times, thickness of 2-6mm, and 5 - 25% of rates of an open cell etc., is proposed by JP,6-344483,A. The foaming laminating sheet for automobile interior material using these denaturation PPE system resin is excellent in thermal resistance, and since it is lightweight, it supposes that hanging down by the deformation and the self-weight under an elevated temperature etc. will be improvable.

[0006] Furthermore, although the automobile is high-performance[ upgrading and ]-ized and calm nature in the car is called for in recent years In order not to give the absorption-of-sound engine performance which is deeply related to calm nature in the car in the automobile interior material using the above-mentioned denaturation PPE system resin foaming laminating sheet but to make the absorption-of-sound engine performance give To stick acoustic material, such as use of the expensive epidermis material to which the absorption-of-sound engine performance was given, and an urethane foaming layer, etc. was needed, and the rise of ingredient cost or a manufacturing cost was caused.

[0007] On the other hand, what used urethane foam (JP,63-199182,A), urethane foam, fiber (JP,2-63703,A), and a staple fiber (JP,2-95838,A) from the former as automobile interior material equipped with the absorption-of-sound engine performance is known.

In the automobile interior material equipped with these absorption-of-sound engine performance, if a sound hits a base material, the viscous friction of air arises [ that aerial vibration ] in propagation and this hole part to the air of the hole part inside a base material, a part of energy of a sound will be transformed into heat energy, and the absorption-of-sound engine performance will arise. That is, by resistance to a motion of air, the vibration declines and the effectiveness that a sound becomes small is used. In addition, in order to make this effectiveness discover, a base material needs to have permeability. However, when the base material which has permeability was used and the flow of air arose from the interior-of-a-room side of a car to an outdoor side, since an epidermis layer played a role of a filter and the epidermis layer upper part became dirty in the shape of a hole, it had become a problem.

[0008]

[Means for Solving the Problem] It was making a foaming layer form into high foaming in the closed cell system foaming laminating sheet of the non-permeability considered that grant of the former absorption-of-sound engine performance is difficult, and the degree of freedom of vibration of a non-foaming layer by which the laminating was carried out to the foaming layer raises, and it came to complete [ that the absorption-of-sound engine performance can give by using the cross protection of the sound by vibration of a non-foaming layer, and ] header this invention wholeheartedly as a result of research that this invention persons should solve the above-mentioned problem.

[0009] That is, this invention is automobile interior material which it has the structure which carried out the laminating of the non-foaming layer (4 5) which becomes both sides of a foaming layer (3) to which a foaming layered product (2) uses denaturation polyphenylene ether system resin as base material resin from thermoplastics in the automobile interior material which consists of [1] epidermis material (1) and a foaming layered product (2), and the expansion ratio of a foaming layer (3) exceeds 20 times, and is characterized by to be 100 or less times.

[2] Automobile interior material given in [1] characterized by being 25 to 70 times the expansion ratio of a foaming layer (3) of this.

[3] [1] characterized by the thermoplastics which is base material resin of a non-foaming layer (4) being denaturation polyphenylene ether system resin, or automobile interior material given in [2].

[4] Automobile interior material of any 1 publication of [1] - [3] characterized by for the content of the phenylene ether component in the denaturation polyphenylene ether system resin which is base material resin of a foaming layer (3) being 35 % of the

weight - 75 % of the weight, and the content of a styrene system component being 65 % of the weight - 25 % of the weight.

[0010]

[Embodiment of the Invention] Next, the example of the automobile interior material concerning this invention and the foaming laminating sheet for automobile interior material is explained in detail based on a drawing.

[0011] Drawing 1 shows the configuration of the automobile interior material concerning 1 operation gestalt of this invention, it comes to form the non-foaming layer (an in-the-car side non-foaming layer (4) and vehicle outside non-foaming layer (5)) which uses thermoplastics as base material resin in both sides of the foaming layer (3) which uses heat resistant resin as base material resin, and the laminating of the epidermis material (1) is carried out to the top face of an in-the-car side non-foaming layer (4) through the hot-melt-adhesive layer (6).

[0012] The automobile interior material which the foaming layer (3) which uses heat resistant resin as base material resin is a layer used as the base of automobile interior material, and is a secondary foaming laminate-molding object since this layer (3) consists of resin with good thermal resistance and moldability can fabricate easily. Moreover, since this layer (3) is a foaming layer, it is lightweight and excels in adiathermic, and since the consistency is low, the amount of use resin is little, and it ends, and has cost competitiveness.

[0013] Any resin known by this contractor can be used for it under the condition that the heat resistant resin used as base material resin of the foaming layer (3) of this invention has thermal resistance. if it illustrates, it will be polyester resin illustrated with denaturation polyphenylene ether system resin (denaturation PPE system resin); polycarbonate resin; and polybutylene terephthalates, and polyethylene terephthalate, such as a blend object of heat-resistant polystyrene system resin; polystyrene or heat-resistant polystyrene, such as a styrene-acrylic-acid copolymer, a styrene maleic anhydride copolymer, and a styrene-itaconic-acid copolymer, and polyphenylene ether (PPE), and a styrene graft polymerization object to PPE. [, such as a styrene phenylene ether copolymer, ] Two or more sorts can also be used for these resin. When denaturation PPE system resin is used as base material resin of a foaming sheet also in this, it excels in quality, such as thermal resistance and rigidity, and also is desirable at workability and the point that manufacture is easy.

[0014] As PPE system resin used for conversion PPE system resin For example, Pori (2, 6-dimethyl phenylene -1, 4-ether), Pori (2-methyl-6-ethyl phenylene-4-ether), Pori (2, 6-diethyl phenylene 1, 4-ether), Pori (2. 6-diethyl phenylene -1, 4-ether), Pori (the

2-methyl-6-n-propyl phenylene -1, 4-ether), Pori (the 2-methyl-6-n-butyl phenylene -1, 4-ether), Pori (the 2-methyl-6-KURORU phenylene -1, 4-ether), Pori (the 2-methyl-6-bromine phenylene -1, 4-ether), Pori (the 2-ethyl-6-KURORU phenylene -1, 4-ether), etc. are mentioned, and these are independent -- or two or more sorts are combined and it is used.

[0015] PS system resin which forms PPE system resin and mixed resin is resin which uses styrene or its derivative, for example, alpha methyl styrene, 2, 4-dimethyl styrene, mono-KURORU styrene, dichloro styrene, p-methyl styrene, ethyl styrene, etc. as a principal component among denaturation PPE system resin. Therefore, PS system resin may be the copolymer made by copolymerizing not only with the homopolymer which consists only of styrene or a styrene derivative but with other monomers.

[0016] Moreover, as an example of a polymerization and the styrene monomer which carries out graft polymerization preferably, styrene, alpha methyl styrene, 2, 4-dimethyl styrene, mono-KURORU styrene, dichloro styrene, p-methyl styrene, ethyl styrene, etc. are raised to said PPE system resin, for example. These may be used independently and may be combined two or more sorts. Among these, styrene is desirable from versatility and the point of cost.

[0017] As base material resin used for the foaming layer of this invention, when using conversion PPE system resin As a phenylene ether component, 65 - 25 weight section desirable still more preferably as 35 - 75 weight section and a styrene component as a phenylene ether component -- as 35 - 60 weight section and a styrene component -- 65 - 40 weight section -- 62 - 42 weight section is good as 38 - 58 weight section and a styrene component as a phenylene ether component especially preferably. It is in the inclination for thermal resistance to be inferior when there are few mixed rates of PPE system resin, and when there are many mixed rates of PPE system resin, there is an inclination for the viscosity at the time of a heating flow to rise, and for foaming to become difficult.

[0018] As for a denaturation PPE system resin foaming layer, it is desirable that thickness is 3-20mm and further 4-10mm. The thickness of a foaming layer may be inferior to reinforcement and adiathermic in it being less than 3mm, and it may not be suitable as automobile interior material. On the other hand, when exceeding 20mm, it may be unsuitable practically from the reasons of reservation of the tooth space of the automobile interior of a room, the limit on interior design, etc.

[0019] Expansion ratio exceeds 20 times and, as for a denaturation PPE system resin foaming layer, it is desirable that they are 100 or less times and further 25 to 70 times. They are 30 to 60 times most preferably. When automobile interior material [ in / in

this / this invention ] gathers the scale factor of a foaming layer, a spring multiplier is reduced, the cross protection of the sound by vibration of the non-foaming layer by which the laminating was carried out to the foaming layer is used, and when expansion ratio is 20 or less times, the effectiveness of spring constant reduction does not tend not to improve rather than is enough. [ absorption-of-sound engine performance's ] Moreover, when expansion ratio exceeds 100 times, a cel film consistency becomes low too much, and there is an inclination for thermal resistance to get worse.

[0020] 70% or more and 80 more% or more of a denaturation PPE foaming layer has a desirable rate of a closed cell. When the rate of a closed cell is less than 70%, there is an inclination to be inferior to adiathermic and rigidity.

[0021] To the base material resin of the foaming layer (3) used in this invention, a cellular regulator, a shock-proof amelioration agent, lubricant, an antioxidant, an antistatic agent, a pigment, a stabilizer, an odor reduction agent, etc. may be added if needed.

[0022] Next, the non-foaming layer (4 5) of thermoplastics is formed in both sides of a heat-resistant-resin foaming layer (3) at the automobile interior material concerning this invention. It has the work which controls the heating contraction by an in-the-car side non-foaming layer (4) changing a configuration in the direction in which the work which controls the heating contraction of epidermis material (1) by which a laminating is carried out to the front face of one of these, and the cel which became flat for the foaming layer (3) in the front face of another side to be extended at the time of shaping cancel ellipticity at the time of heating among these non-foaming layers (4 5). Moreover, a vehicle outside non-foaming layer (5) has the work which controls heating contraction of a foaming layer (3).

[0023] It is very difficult to influence heating contraction of a foaming layer (3) greatly here by whenever [ change / of a cel configuration and the cel internal pressure by care of health /, rate of closed cell, and stoving temperature ] etc., and to control the contraction. However, since deformation of the front section under an elevated temperature is greatly influenced by heating contraction of a foaming layer (3), it becomes important [ controlling heating contraction of a foaming layer (3) by the non-foaming layer (4 5) by which the laminating was carried out to both sides of a foaming layer (3) ].

[0024] next, as thermoplastics used for a non-foaming layer (4 5) Although heat-resistant PS system resin, denaturation PPE system resin, a polypropylene resin, polyethylene terephthalate (PET) system resin, polyamide (nylon) system resin, etc. are mentioned, and these are independent, or two or more sorts are combined and it is

used When using denaturation PPE system resin as a foaming layer (3), denaturation PPE system resin and heat-resistant PS system resin are preferably used from an adhesive viewpoint with this resin layer.

[0025] When using denaturation PPE system resin as a non-foaming layer (4 5) The monomer which makes a subject PPE system resin and a styrene system compound, or its polymer performs denaturation by the polymerization or mixing like the case of an above-mentioned foaming layer (3). For example, mixture with the PPE-styrene copolymer which carried out the polymerization of the styrene monomer to the mixed resin of PPE system resin and PS system resin and PPE system resin, this copolymer and PS system resin, or PPE system resin, the mixture of that copolymer, PPE system resin, and PS system resin, etc. are mentioned. among these -- coming out -- the mixed resin of PPE system resin and PS system resin is easy for manufacture -- etc. -- it is desirable from a point.

[0026] It is the same as that of the case where the example of these PPE(s) system resin, PS system resin, or a styrene monomer, the example of instantiation, PS system resin, a styrene monomer, and the monomer in which a polymerization is possible, the reason for using it, etc. are explained in the foaming layer 3 although it was desirable. However, the styrene-butadiene copolymer represented with HIPS is added as a desirable example of PS system resin from the point that the shock-proof improvement effect of a non-foaming layer (4 5) is large.

[0027] When using conversion PPE system resin, as a phenylene ether component, 75 - 25 weight section is desirable still more desirable as 15 - 75 weight section and a styrene component, and 80 - 40 weight section is good as base material resin used for a non-foaming layer (4 5), as 20 - 60 weight section and a styrene component as a phenylene ether component. If it is in the inclination for thermal resistance to be inferior when the operating rate of PPE system resin is too small and the operating rate of PPE system resin is too large, the viscosity at the time of a heating flow may rise, and shaping may become difficult.

[0028] Heat-resistant PS system resin desirable as base material resin of a non-foaming layer (4 5) is the copolymer (it is described as "St system copolymer" below.) of styrene or its derivative, and other monomers, and nitril compounds, such as unsaturated carboxylic acid, such as a maleic acid, a fumaric acid, an acrylic acid, methacrylic acid, and an itaconic acid, or a derivative of those and its acid anhydride, acrylonitrile, and meta-acrylonitrile, or the derivative of those is mentioned, for example as the styrene which has a heat-resistant improvement effect or its derivative, and a copolymerizable monomer. These may be used independently, may be combined

two or more kinds and may be used. The styrene which has a heat-resistant improvement effect, or the derivative and a copolymerizable monomer is usually preferably used in 30 or less % of the weight of the range 40 or less % of the weight.

[0029] Moreover, in case the polymerization of styrene or the styrene derivative is carried out, you may be a copolymer with nitril compounds, such as unsaturated carboxylic acid, such as that to which the polymerization of synthetic rubber or the rubber latex was added and carried out, a maleic acid, a fumaric acid, an acrylic acid, methacrylic acid, and an itaconic acid, or a derivative of those and its acid anhydride, acrylonitrile, and meta-acrylonitrile. Among these, a styrene-maleic-anhydride system copolymer, a styrene-acrylic-acid system copolymer, a styrene-methacrylic acid system copolymer, and acrylonitrile-butadiene-styrene copolymer are desirable from the heat-resistant improvement effect, versatility, and the field of cost then.

[0030] Heat-resistant PS system resin may be used independently, or may be combined two or more kinds. Moreover, heat-resistant PS system resin may be blended with other thermoplastics, and may be used, and vinyl chloride system resin, such as polyolefines, such as polystyrene, HIPS, a polycarbonate, polyester, polyethylene, and polypropylene, and a polyvinyl chloride, a polyether ether sulfone, polysulfone, polyamides, those copolymers, etc. are raised as thermoplastics to blend. Among these, the field of that versatility and homogeneity distribution are possible then, that the shock-proof improvement effect of a non-foaming layer is large, and cost etc. to HIPS is desirable. Being able to use a thing well-known as HIPS, the content of a rubber component is usually 1 - 15 % of the weight.

[0031] The thickness of a non-foaming layer (4 5) has 50-300 micrometers desirable further 75-200 micrometers. When the thickness of a non-foaming layer (4 5) is thinner than 50 micrometers, reinforcement, rigidity, thermal resistance, etc. are inferior, and in being thicker than 300 micrometers, it is in the inclination for the moldability of a laminating sheet to be inferior.

[0032] Moreover, this invention is a thing using the cross protection of the sound by vibration of a non-foaming layer (4 5) by which the laminating was carried out to the foaming layer (3) made to high-foam, and it makes it possible to improve the absorption-of-sound engine performance in the frequency domain which tunes up a resonance frequency and is needed as automobile interior material by adjusting the rigidity of a non-foaming layer (4 5), and a superintendent officer. Therefore, the superintendent officer of a non-foaming layer and rigidity are set as arbitration by the frequency domain which wants to improve the absorption-of-sound engine performance.

[0033] Furthermore, the laminating of the shock absorbing material (air cap) of the

structure which shut up air between the resin films of foam and non-permeability which become a non-foaming layer (4 5) from polyolefine forms, such as nonwoven fabrics, such as felt, polyurethane foam, and polyethylene, polypropylene, etc. may be carried out to a non-foaming layer (4 5) through an adhesives layer for the purpose of broadcloth-izing a resonance vibration peak. Since-izing of the resonance vibration peak can be carried out [ broadcloth ] cheaply, especially the thing done to a non-foaming layer (4 5) for the laminating of the shock absorbing material (air cap) is effective.

[0034] independent [ in a shock-proof amelioration agent, a bulking agent, lubricant, an antioxidant, an antistatic agent, a pigment, a stabilizer, an odor reduction agent, etc. ] if needed, when forming a non-foaming layer (4 5) -- or two or more sorts may be combined and you may add.

[0035] In case a shock-proof amelioration agent conveys punching processing, laminating sheet, and Plastic solid at the time of fabricating the laminating sheet on which carried out the laminating of the non-foaming layer (4 5) to the foaming layer (3), and it was made to foam the 2nd order as automobile interior material, it is effective in preventing the crack of a non-foaming layer (4 5) etc. If the effectiveness is demonstrated by mixing to base material resin as a shock-proof amelioration agent, it can be especially used without limitation. A shock-proof amelioration agent may be the component which can demonstrate the shock-proof amelioration effectiveness introduced into thermoplastics by denaturation by the polymerization, for example, also when mixing what contains a shock-proof amelioration component like HIPS and using it for a non-foaming layer, it can give shock resistance to a non-foaming layer (4 5).

[0036] A hot-melt-adhesive layer (6) is formed in the front face of the in-the-car side non-foaming layer (4) of a foaming laminating sheet. Hot melt adhesive is usually used for pasting up epidermis material (1) on a Plastic solid. As said hot melt adhesive, what uses resin, such as a polyolefine system, a denaturation polyolefine system, a polyurethane system, an ethylene-vinyl acetate copolymerization resin system, a polyamide system, a polyester system, a thermoplastic rubber system, a styrene-butane diene copolymer system, and a styrene-isoprene copolymer system, as a component is mentioned.

[0037] As an example of epidermis material (1), what is used as conventional automobile interior material can be used. For example, although textile fabrics and a nonwoven fabric are arranged, in these, they are polyethylene terephthalate, polypropylene, a polyamide (nylon), a polyacrylonitrile, and modacryl (for example, the

thing of natural materials, such as synthetic resin, such as "a money Charon (trademark)" by Kaneka Co., Ltd. etc., and wool, cotton, and the thing which combined them suitably are used.). What carried out the laminating of the foaming layer which changes from polyolefine forms, such as polyurethane foam, and polyethylene, polypropylene, to such epidermis material (1) further if needed in the monolayer or the double layer can be used.

[0038]

[Example] Although this invention is further explained at a detail based on an example below, thereby, this invention does not receive a limit at all. The resin used for the example and the example of a comparison is shown in Table 1. In addition, each sign about the resin shown in Table 1 is as follows.

[0039]

[Table 1]

	商品名	製造会社	PPE成分 (%)	PS成分 (%)	ゴム成分 (%)	その他
変性PPE樹脂(a)	ノリル EFN4230	日本GE プラスチック㈱	70	30		
PS樹脂(b)	スタイロン G8102	A&M ポリスチレン㈱		100		
SMAA共重合体 樹脂(c)	スタイロン G9001	A&M ポリスチレン㈱		92		メタクリル酸 8
HIPS樹脂(d)	スタイロン H8117	A&M ポリスチレン㈱		87.5	12.5	
耐衝撃性改良剤 (e)	タフブレン 125	A&M ポリスチレン㈱			100	

[The class of resin]

Denaturation PPE : Denaturation polyphenylene ether PS : Polystyrene SMAA copolymer: Styrene-methacrylic acid copolymer HIPS : The evaluation approach performed in high impact polystyrene, the example, and the example of a comparison is shown below.

[Expansion ratio] After starting a sample from the general section of automobile interior material and separating each configuration layer, the consistency df of a foaming layer is measured according to JIS K 7222, and it is the consistency dp of denaturation PPE system resin. It measured according to JIS K 7112, and asked from the degree type.

Expansion ratio =  $dp/df$  [0040] [Mounting heat resistance test] The automobile head-lining section (cut body) was equipped with automobile interior material (width-of-face [ of 930mm ] x die length of 1424mm) as shown in drawing 2 , and it

fixed so that it might become equivalent to a real vehicle through a sun visor, a room mirror, a room lamp, GANISSHU, and a pillar. In addition, for an assist grip attaching hole and 8, as for a sun visor stop mounting hole and 10, a sun visor attaching hole and 9 are [ seven in drawing / a room mirror attaching hole and 11 ] tonneau-light attaching holes. Moreover, point of measurement was symmetrically stamped on the front part at intervals of 120mm with the center line of six points and a Plastic solid (a-f in drawing 1 ). The marked line was formed near the point of measurement of the front section, and a vertical distance was measured. Next, after supplying the automobile head-lining section which attached head-lining material in the thermostatic chamber set as 100\*\*1 degree C for 24 hours, the absolute value of the amount of dimensional changes of the perpendicular direction of the point of measurement stamped on the Plastic solid front section was measured, and the maximum of a-f was recorded. in addition, the max entered in Table 3 -- a variation rate -- an amount is the value which measured plus (+) and the perpendicular hanging-down direction for the direction of a perpendicular curvature riser as minus (-).

[0041] As criteria of a judgment, the following criteria were used in consideration of the practicality as automobile interior material.

**耐熱変位量**      ○ ・ ・ ± 2 . 0 mm以下  
                          × ・ ・ ± 2 . 0 mm以上

[Absorption-of-sound nature] The test piece was cut down from the general section of automobile interior material, and measurement of the normal incidence sound absorption coefficient by JIS-A -1405 estimated. In addition, in order to bring close to the mounting condition to an automobile, 20mm of back air spaces was prepared, and incidence of the sound was carried out from the epidermis material side.

[Permeability] The test piece was cut down from the general section of automobile interior material, and measurement of the quantity of airflow by JIS-L -1004 estimated. As criteria of a judgment, the following criteria were used in consideration of the practicality as automobile interior material.

**通気度**      ○ ・ ・ 通気度 0 . 0 1 c c / c m <sup>2</sup> s e c 以下  
                          × ・ ・ 通気度 0 . 0 1 c c / c m <sup>2</sup> s e c 以上

[Effect of the Invention] (Example 1)

Foaming layer :P Thickness of 5.8mm it is thin from 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, Foaming layer interior-of-a-room side [ one 32 times the expansion ratio of this ] non-foaming layer :P 20 % of the weight of PE system resinous principles, Film outdoor with a thickness of 120 micrometers it is thin from 80 % of the weight (denaturation PPE (resin a) 28.6 section and the PS (resin b) 71.4 section are mixed) of PS system resinous principles side non-foaming layer : The SMAA (copolymer-resin c) 47.5 section and the HIPS (resin d) 47.5 section, Film epidermis material layer with a thickness of 150 micrometers it is thin from the impact-proof amelioration (agent e) 5 section :P ET system nonwoven fabric epidermis material (100 about 1.0mm in thickness [ RVC/ by Japan Vilene Co., Ltd. /- ])

Adhesives layer: The piece of a general section blank test of the automobile interior material which consists of a hot melt film (the clan by Kurabo Industries [, Ltd. ], Ltd. the better X2200) was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 3 and Table 2. Furthermore the cut body was equipped with automobile interior material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[0043] (Example 2)

Foaming layer :P It considered as the foaming layer 34 times the expansion ratio [ the thickness of 5.1mm, and ] of this which consists of 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, and except it, the piece of a general section blank test of the automobile interior material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 3 and Table 2. Furthermore the cut body was equipped with automobile interior material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[0044] (Example 3)

Foaming layer :P It considered as the foaming layer 42 times the expansion ratio [ the thickness of 5.0mm, and ] of this which consists of 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, and

except it, the piece of a general section blank test of the automobile interior material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 3 and Table 2. Furthermore the cut body was equipped with automobile interior material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[0045] (Example 4)

Outdoor side non-foaming layer: 20 % of the weight of PPE system resinous principles, 76.2 % of the weight of PS system resinous principles, rubber component It considered as the film with a thickness of 120 micrometers it is thin from 3.8% (the denaturation PPE (resin a) 28.6 section, the PS (resin b) 41.4 section, and the HIPS (resin d) 30 section are mixed), and except it, the piece of a general section blank test of the automobile interior material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 4 and Table 2. Furthermore the cut body was equipped with automobile interior material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[0046] (Example 5) It is shock absorbing material (except having carried out the laminating of the air-bubbles shock absorbing material made from Sakai Chemical-industry polyethylene "MINAPAKKU", the piece of a general section blank test of the automobile interior material of the same configuration as an example 3 was started, and a normal incidence sound absorption coefficient and permeability were measured.) on an outdoor side skin. A measurement result is shown in drawing 4 and Table 2. Furthermore the cut body was equipped with automobile interior material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[0047] (Example 1 of a comparison)

Foaming layer :P It considered as the foaming layer 19 times the expansion ratio [ the thickness of 3.5mm, and ] of this which consists of 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, and except it, the piece of a general section blank test of the automobile interior material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 5 and Table 2. Furthermore the cut body was equipped with automobile interior material, and the mounting heat test of 100-degree-C 24 hours was performed.

A measurement result is shown in Table 2.

[0048] (Example 2 of a comparison)

Foaming layer :P It considered as the foaming layer 12 times the expansion ratio [ the thickness of 2.2mm, and ] of this which consists of 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, and except it, the piece of a general section blank test of the automobile interior material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 5 and Table 2. Furthermore the cut body was equipped with automobile interior material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[0049] (Example 3 of a comparison)

Foaming layer :P It considered as the foaming layer 15 times the expansion ratio [ the thickness of 1.8mm, and ] of this which consists of 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, and except it, the piece of a general section blank test of the automobile interior material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 3 and Table 2. Furthermore the cut body was equipped with automobile interior material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[0050] (Example 4 of a comparison)

Foaming layer :P It considered as the foaming layer 32 times the expansion ratio [ the thickness of 5.8mm, and ] of this which consists of 20 % of the weight of PE system resinous principles, and 80 % of the weight (the denaturation PPE (resin a) 28.6 section and the PS (resin b) 71.4 section are mixed) of PS system resinous principles, and except it, the cut body was equipped with the automobile interior material of the same configuration as an example 1, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in Table 2.

[Table 2]

	100℃実装耐熱試験 最大変位量(mm)	判定	通気度	判定	垂直入射吸音率 1～5kHzの平均値
実施例1	-1.5	○	0.0	○	0.18
実施例2	-1.2	○	0.0	○	0.18
実施例3	-0.9	○	0.0	○	0.21
実施例4	0.2	○	0.0	○	0.24
実施例5	-1.1	○	0.0	○	0.24
比較例1	-1.2	○	0.0	○	0.07
比較例2	-1.5	○	0.0	○	0.09
比較例3	-1.3	○	0.0	○	0.05
比較例4	-4.5	x	0.0	○	—————

[0051]

[Effect of the Invention] Thermal resistance is improved and, as for the automobile interior material of this invention, deformation by the use under an elevated temperature and hanging down by self-weight are improved. And the non-permeability made difficult until now and the outstanding coexistence of the absorption-of-sound engine performance are attained.

## TECHNICAL FIELD

[Field of the Invention] This invention relates to automobile inner package material. in more detail, in order to raise crew's amenity, the noise in the car can be reduced -- automobile inner package material Seki is carried out.

## PRIOR ART

[Description of the Prior Art] Conventionally, what carried out the laminating of the urethane foam to the base material which makes thermoplastics foam a subject as automobile inner package material, and the thing which fabricated the laminating sheet which carried out the laminating of the non-foaming layer of a styrene maleic anhydride copolymer in the vertical side of the foaming layer of a styrene maleic anhydride copolymer in the desired configuration are used widely. Those automobile inner package material has the description that it is lightweight, adiathermic is high and fabricating-operation nature is excellent.

[0003] However, when the long duration pan of the above conventional automobile inner package material was carried out to the elevated temperature, since thermal resistance was inadequate, the front section might hang down by the self-weight, and

problems, such as producing a (heat sag) and deformation, might be generated.

[0004] Then, in order to solve these problems, the automobile inner package material which used an inorganic glass fiber and composite material of plastics as the base has come to be used. However, in this composite material, although the quality of thermal resistance is maintainable, since lightweight-ization was not able to be attained upwards and the glass fiber was used, there was a problem that recycle nature was bad and became cost high.

[0005] In order to solve such a problem, the foaming laminating sheet for automobile inner package material using the foaming laminating sheet which carried out the laminating of the denaturation PPE system resin non-foaming layer to both sides of the denaturation polyphenylene ether system resin (it is described as "denaturation PPE system resin" below.) foaming layer which is lightweight and has thermal resistance is proposed (JP,4-11162,U). Moreover, the foaming laminating sheet for automobile inner package material which carried out the laminating of the denaturation PPE system resin non-foaming layer to both sides of the denaturation PPE system resin foaming layer which specified many physical properties, such as expansion ratio of 5-20 times, thickness of 2-6mm, and 5 - 25% of rates of an open cell etc., is proposed by JP,6-344483,A. The foaming laminating sheet for automobile inner package material using these denaturation PPE system resin is excellent in thermal resistance, and since it is lightweight, it supposes that hanging down by the deformation and the self-weight under an elevated temperature etc. will be improvable.

[0006] Furthermore, although the automobile is high-performance[ upgrading and ]-ized and calm nature in the car is called for in recent years In order not to give the absorption-of-sound engine performance which is deeply related to calm nature in the car in the automobile inner package material using the above-mentioned denaturation PPE system resin foaming laminating sheet but to make the absorption-of-sound engine performance give To stick acoustic material, such as an activity of the expensive epidermis material to which the absorption-of-sound engine performance was given, and an urethane foaming layer, etc. was needed, and the rise of ingredient cost or a manufacturing cost was caused.

[0007] On the other hand, what used urethane foam (JP,63-199182,A), urethane foam, fiber (JP,2-63703,A), and a staple fiber (JP,2-95838,A) from the former as automobile inner package material equipped with the absorption-of-sound engine performance is known. In the automobile inner package material equipped with these absorption-of-sound engine performance, if a sound hits a base material, the viscous friction of air arises [ that aerial vibration ] in propagation and this hole part to the air

of the hole part inside a base material, a part of energy of a sound will be transformed into heat energy, and the absorption-of-sound engine performance will arise. That is, by resistance to a motion of air, the oscillation declines and the effectiveness that a sound becomes small is used. In addition, in order to make this effectiveness discover, a base material needs to have permeability. However, when the base material which has permeability was used and the flow of air arose from the interior-of-a-room side of a car to an outdoor side, since an epidermis layer played a role of a filter and the epidermis layer upper part became dirty in the shape of a hole, it had become a problem.

## EFFECT OF THE INVENTION

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### [Effect of the Invention] (Example 1)

Foaming layer :P Thickness of 5.8mm it is thin from 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, Foaming layer interior-of-a-room side [ one 32 times the expansion ratio of this ] non-foaming layer :P 20 % of the weight of PE system resinous principles, Film outdoor with a thickness of 120 micrometers it is thin from 80 % of the weight (denaturation PPE (resin a) 28.6 section and the PS (resin b) 71.4 section are mixed) of PS system resinous principles side non-foaming layer : The SMAA (copolymer-resin c) 47.5 section and the HIPS (resin d) 47.5 section, Film epidermis material layer with a thickness of 150 micrometers it is thin from the shock-resistant amelioration (agent e) 5 section :P ET system nonwoven fabric epidermis material (100 about 1.0mm in thickness [ RVC/ by Japan Vilene Co., Ltd. /- ])

Adhesives layer: The general section blank test piece of the automobile inner package material which consists of a hot melt film (Klang by Kurabo Industries [ , Ltd. ], Ltd. the better X2200) was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 3 and a table 2. Furthermore the cut body was equipped with automobile inner package material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in a table 2.

### [0043] (Example 2)

Foaming layer :P It considered as the foaming layer 34 times the expansion ratio [ the thickness of 5.1mm, and ] of this which consists of 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, and except it, the general section blank test piece of the automobile inner package material

of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 3 and a table 2. Furthermore the cut body was equipped with automobile inner package material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in a table 2.

[0044] (Example 3)

Foaming layer :P It considered as the foaming layer 42 times the expansion ratio [ the thickness of 5.0mm, and ] of this which consists of 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, and except it, the general section blank test piece of the automobile inner package material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 3 and a table 2. Furthermore the cut body was equipped with automobile inner package material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in a table 2.

[0045] (Example 4)

Outdoor side non-foaming layer: 20 % of the weight of PPE system resinous principles, 76.2 % of the weight of PS system resinous principles, rubber component It considered as the film with a thickness of 120 micrometers it is thin from 3.8% (the denaturation PPE (resin a) 28.6 section, the PS (resin b) 41.4 section, and the HIPS (resin d) 30 section are mixed), and except it, the general section blank test piece of the automobile inner package material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 4 and a table 2. Furthermore the cut body was equipped with automobile inner package material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in a table 2.

[0046] (Example 5) It is shock absorbing material (except having carried out the laminating of the air-bubbles shock absorbing material made from Sakai Chemical-industry polyethylene "MINAPAKKU", the general section blank test piece of the automobile inner package material of the same configuration as an example 3 was started, and a normal incidence sound absorption coefficient and permeability were measured.) on an outdoor side skin. A measurement result is shown in drawing 4 and a table 2. Furthermore the cut body was equipped with automobile inner package material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in a table 2.

[0047] (Example 1 of a comparison)

Foaming layer :P It considered as the foaming layer 19 times the expansion ratio [ the thickness of 3.5mm, and ] of this which consists of 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, and except it, the general section blank test piece of the automobile inner package material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 5 and a table 2. Furthermore the cut body was equipped with automobile inner package material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in a table 2.

[0048] (Example 2 of a comparison)

Foaming layer :P It considered as the foaming layer 12 times the expansion ratio [ the thickness of 2.2mm, and ] of this which consists of 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, and except it, the general section blank test piece of the automobile inner package material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 5 and a table 2. Furthermore the cut body was equipped with automobile inner package material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in a table 2.

[0049] (Example 3 of a comparison)

Foaming layer :P It considered as the foaming layer 15 times the expansion ratio [ the thickness of 1.8mm, and ] of this which consists of 40 % of the weight of PE system resinous principles, and 60 % of the weight (the denaturation PPE (resin a) 72.7 section and the PS (resin b) 27.3 section are mixed) of PS system resinous principles, and except it, the general section blank test piece of the automobile inner package material of the same configuration as an example 1 was started, and a normal incidence sound absorption coefficient and permeability were measured. A measurement result is shown in drawing 3 and a table 2. Furthermore the cut body was equipped with automobile inner package material, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in a table 2.

[0050] (Example 4 of a comparison)

Foaming layer :P It considered as the foaming layer 32 times the expansion ratio [ the thickness of 5.8mm, and ] of this which consists of 20 % of the weight of PE system

resinous principles, and 80 % of the weight (the denaturation PPE (resin a) 28.6 section and the PS (resin b) 71.4 section are mixed) of PS system resinous principles, and except it, the cut body was equipped with the automobile inner package material of the same configuration as an example 1, and the mounting heat test of 100-degree-C 24 hours was performed. A measurement result is shown in a table 2.

[A table 2]

	100℃実装耐熱試験 最大変位量(mm)	判定	歪み度	判定	垂直入射吸音率 1～5kHzの平均値
実施例1	-1.5	○	0.0	○	0.16
実施例2	-1.2	○	0.0	○	0.18
実施例3	-0.9	○	0.0	○	0.21
実施例4	0.2	○	0.0	○	0.24
実施例5	-1.1	○	0.0	○	0.24
比較例1	-1.2	○	0.0	○	0.07
比較例2	-1.5	○	0.0	○	0.09
比較例3	-1.3	○	0.0	○	0.05
比較例4	-4.5	x	0.0	○	—

MEANS

[Means for Solving the Problem] It was making a foaming layer form into high foaming in the closed cell system foaming laminating sheet of the non-permeability considered that grant of the former absorption-of-sound engine performance is difficult, and the degree of freedom of the oscillation of a non-foaming layer by which the laminating was carried out to the foaming layer raises, and it came to complete [ that the absorption-of-sound engine performance can give by using the cross protection of the sound by oscillation of a non-foaming layer, and ] header this invention wholeheartedly as a result of research that this invention persons should solve the above-mentioned problem.

[0009] That is, this invention is automobile inner package material which it has the structure which carried out the laminating of the non-foaming layer (4 5) which becomes both sides of a foaming layer (3) to which a foaming layered product (2) uses denaturation polyphenylene ether system resin as base material resin from thermoplastics in the automobile inner package material which consists of [1] epidermis material (1) and a foaming layered product (2), and the expansion ratio of a foaming layer (3) exceeds 20 times, and is characterized by to be 100 or less times. [2] Automobile inner package material given in [1] characterized by being 25 to 70 times the expansion ratio of a foaming layer (3) of this.

[3] [1] characterized by the thermoplastics which is base material resin of a

non-foaming layer (4) being denaturation polyphenylene ether system resin, or automobile inner package material given in [2].

[4] Automobile inner package material of any 1 publication of [1] - [3] characterized by for the content of the phenylene ether component in the denaturation polyphenylene ether system resin which is base material resin of a foaming layer (3) being 35 % of the weight - 75 % of the weight, and the content of a styrene system component being 65 % of the weight - 25 % of the weight.

[0010]

[Embodiment of the Invention] Next, the example of the automobile inner package material concerning this invention and the foaming laminating sheet for automobile inner package material is explained in detail based on a drawing.

[0011] Drawing 1 shows the configuration of the automobile inner package material concerning 1 operation gestalt of this invention, it comes to form the non-foaming layer (a vehicle inside non-foaming layer (4) and vehicle outside non-foaming layer (5)) which uses thermoplastics as base material resin in both sides of the foaming layer (3) which uses heat resistant resin as base material resin, and the laminating of the epidermis material (1) is carried out to the top face of a vehicle inside non-foaming layer (4) through the hot-melt-adhesive layer (6).

[0012] The automobile inner package material which the foaming layer (3) which uses heat resistant resin as base material resin is a layer used as the base of automobile inner package material, and is a secondary foaming laminate-molding object since this layer (3) consists of resin with good thermal resistance and moldability can fabricate easily. Moreover, since this layer (3) is a foaming layer, it is lightweight and excels in adiathermic, and since the consistency is low, the amount of activity resin is little, and it ends, and has cost competitiveness.

[0013] Any resin known by this contractor can be used for it under the condition that the heat resistant resin used as base material resin of the foaming layer (3) of this invention has thermal resistance. if it illustrates, it will be polyester resin illustrated with denaturation polyphenylene ether system resin (denaturation PPE system resin); polycarbonate resin; and polybutylene terephthalates, and polyethylene terephthalate, such as a blend object of heat-resistant polystyrene system resin; polystyrene or heat-resistant polystyrene, such as a styrene-acrylic-acid copolymer, a styrene maleic anhydride copolymer, and a styrene-itaconic-acid copolymer, and polyphenylene ether (PPE), and a styrene graft polymerization object to PPE. [, such as a styrene phenylene ether copolymer, ] Two or more sorts can also be used for these resin. When denaturation PPE system resin is used as base material resin of a foaming sheet also

in this, it excels in quality, such as thermal resistance and rigidity, and also is desirable at workability and the point that manufacture is easy.

[0014] As PPE system resin used for conversion PPE system resin For example, Pori (2, 6-dimethyl phenylene -1, 4-ether), Pori (2-methyl-6-ethyl phenylene-4-ether), Pori (2, 6-diethyl phenylene 1, 4-ether), Pori (2, 6-diethyl phenylene -1, 4-ether), Pori (the 2-methyl-6-n-propyl phenylene -1, 4-ether), Pori (the 2-methyl-6-n-butyl phenylene -1, 4-ether), Pori (the 2-methyl-6-KURORU phenylene -1, 4-ether), Pori (the 2-methyl-6-bromine phenylene -1, 4-ether), Pori (the 2-ethyl-6-KURORU phenylene -1, 4-ether), etc. are mentioned, and these are independent -- or two or more sorts are combined and it is used.

[0015] PS system resin which forms PPE system resin and mixed resin is resin which uses styrene or its derivative, for example, alpha methyl styrene, 2, 4-dimethyl styrene, mono-KURORU styrene, dichloro styrene, p-methyl styrene, ethyl styrene, etc. as a principal component among denaturation PPE system resin. Therefore, PS system resin may be the copolymer made by copolymerizing not only with the homopolymer which consists only of styrene or a styrene derivative but with other monomers.

[0016] Moreover, as an example of a polymerization and the styrene monomer which carries out graft polymerization preferably, styrene, alpha methyl styrene, 2, 4-dimethyl styrene, mono-KURORU styrene, dichloro styrene, p-methyl styrene, ethyl styrene, etc. are raised to said PPE system resin, for example. These may be used independently and may be combined two or more sorts. Among these, styrene is desirable from versatility and the point of cost.

[0017] As base material resin used for the foaming layer of this invention, when using conversion PPE system resin As a phenylene ether component, 65 - 25 weight section desirable still more preferably as 35 - 75 weight section and a styrene component as a phenylene ether component -- as 35 - 60 weight section and a styrene component -- 65 - 40 weight section -- 62 - 42 weight section is good as 38 - 58 weight section and a styrene component as a phenylene ether component especially preferably. It is in the inclination for thermal resistance to be inferior when there are few mixed rates of PPE system resin, and when there are many mixed rates of PPE system resin, there is an inclination for the viscosity at the time of heating floating to rise, and for foaming to become difficult.

[0018] As for a denaturation PPE system resin foaming layer, it is desirable that thickness is 3-20mm and further 4-10mm. The thickness of a foaming layer may be inferior to reinforcement and adiathermic in it being less than 3mm, and it may not be suitable as automobile inner package material. On the other hand, when exceeding

20mm, it may be unsuitable practically from the reasons of reservation of the tooth space of the automobile interior of a room, the limit on interior design, etc.

[0019] Expansion ratio exceeds 20 times and, as for a denaturation PPE system resin foaming layer, it is desirable that they are 100 or less times and further 25 to 70 times. They are 30 to 60 times most preferably. When automobile inner package material [ in / in this / this invention ] gathers the scale factor of a foaming layer, a spring multiplier is reduced, the cross protection of the sound by oscillation of the non-foaming layer by which the laminating was carried out to the foaming layer is used, and when expansion ratio is 20 or less times, the effectiveness of spring constant reduction does not tend not to improve rather than is enough. [ absorption-of-sound engine performance's ]

Moreover, when expansion ratio exceeds 100 times, a cel film consistency becomes low too much, and there is an inclination for thermal resistance to get worse.

[0020] 70% or more and 80 more% or more of a denaturation PPE foaming layer has a desirable rate of a closed cell. When the rate of a closed cell is less than 70%, there is an inclination to be inferior to adiathermic and rigidity.

[0021] To the base material resin of the foaming layer (3) used in this invention, a cellular regulator, a shock-proof amelioration agent, lubricant, an antioxidant, an antistatic agent, a pigment, a stabilizer, an odor reduction agent, etc. may be added if needed.

[0022] Next, the non-foaming layer (4 5) of thermoplastics is formed in both sides of a heat-resistant-resin foaming layer (3) at the automobile inner package material concerning this invention. It has the work which controls the heating contraction by a vehicle inside non-foaming layer (4) changing a configuration in the direction in which the work which controls the heating contraction of epidermis material (1) by which a laminating is carried out to the front face of one of these, and the cel which became flat for the foaming layer (3) in the front face of another side to be extended at the time of shaping cancel flattening at the time of heating among these non-foaming layers (4 5). Moreover, a vehicle outside non-foaming layer (5) has the work which controls heating contraction of a foaming layer (3).

[0023] It is dramatically difficult to influence heating contraction of a foaming layer (3) greatly here by whenever [ change / of a cel configuration and the cel internal pressure by cure /, rate of closed cell, and stoving temperature ] etc., and to control the contraction. However, since deformation of the front section under an elevated temperature is greatly influenced by heating contraction of a foaming layer (3), it becomes important [ controlling heating contraction of a foaming layer (3) by the non-foaming layer (4 5) by which the laminating was carried out to both sides of a

foaming layer (3) ].

[0024] next, as thermoplastics used for a non-foaming layer (4 5) Although heat-resistant PS system resin, denaturation PPE system resin, a polypropylene resin, polyethylene terephthalate (PET) system resin, polyamide (nylon) system resin, etc. are mentioned, and these are independent, or two or more sorts are combined and it is used When using denaturation PPE system resin as a foaming layer (3), denaturation PPE system resin and heat-resistant PS system resin are preferably used from an adhesive viewpoint with this resin layer.

[0025] When using denaturation PPE system resin as a non-foaming layer (4 5) The monomer which makes a subject PPE system resin and a styrene system compound, or its polymer performs denaturation by the polymerization or mixing like the case of an above-mentioned foaming layer (3). For example, mixture with the PPE-styrene copolymer which carried out the polymerization of the styrene monomer to the mixed resin of PPE system resin and PS system resin and PPE system resin, this copolymer and PS system resin, or PPE system resin, the mixture of that copolymer, PPE system resin, and PS system resin, etc. are mentioned. among these -- coming out -- the mixed resin of PPE system resin and PS system resin is easy for manufacture -- etc. -- it is desirable from a point.

[0026] It is the same as that of the case where the example of these PPE(s) system resin, PS system resin, or a styrene monomer, the example of instantiation, PS system resin, a styrene monomer, and the monomer in which a polymerization is possible, the reason for using it, etc. are explained in the foaming layer 3 although it was desirable. However, the styrene-butadiene copolymer represented with HIPS is added as a desirable example of PS system resin from the point that the shock-proof improvement effect of a non-foaming layer (4 5) is large.

[0027] When using conversion PPE system resin, as a phenylene ether component, 75 - 25 weight section is desirable still more desirable as 15 - 75 weight section and a styrene component, and 80 - 40 weight section is good as base material resin used for a non-foaming layer (4 5), as 20 - 60 weight section and a styrene component as a phenylene ether component. If it is in the inclination for thermal resistance to be inferior when the operating rate of PPE system resin is too small and the operating rate of PPE system resin is too large, the viscosity at the time of heating floating may rise and shaping may become difficult.

[0028] Heat-resistant PS system resin desirable as base material resin of a non-foaming layer (4 5) is the copolymer (it is described as "St system copolymer" below.) of styrene or its derivative, and other monomers, and nitril compounds, such as

unsaturated carboxylic acid, such as a maleic acid, a fumaric acid, an acrylic acid, methacrylic acid, and an itaconic acid, or a derivative of those and its acid anhydride, acrylonitrile, and meta-acrylonitrile, or the derivative of those is mentioned, for example as the styrene which has a heat-resistant improvement effect or its derivative, and a copolymerizable monomer. These may be used independently, may be combined two or more kinds and may be used. The styrene which has a heat-resistant improvement effect, or the derivative and a copolymerizable monomer is usually preferably used in 30 or less % of the weight of the range 40 or less % of the weight.

[0029] Moreover, in case the polymerization of styrene or the styrene derivative is carried out, you may be a copolymer with nitril compounds, such as unsaturated carboxylic acid, such as that to which the polymerization of synthetic rubber or the rubber latex was added and carried out, a maleic acid, a fumaric acid, an acrylic acid, methacrylic acid, and an itaconic acid, or a derivative of those and its acid anhydride, acrylonitrile, and meta-acrylonitrile. Among these, a styrene-maleic-anhydride system copolymer, a styrene-acrylic-acid system copolymer, a styrene-methacrylic acid system copolymer, and acrylonitrile-butadiene-styrene copolymer are desirable from the heat-resistant improvement effect, versatility, and the field of cost then.

[0030] Heat-resistant PS system resin may be used independently, or may be combined two or more kinds. Moreover, heat-resistant PS system resin may be blended with other thermoplastics, and may be used, and vinyl chloride system resin, such as polyolefines, such as polystyrene, HIPS, a polycarbonate, polyester, polyethylene, and polypropylene, and a polyvinyl chloride, a polyether ether sulfone, polysulfone, polyamides, those copolymers, etc. are raised as thermoplastics to blend. Among these, the field of that versatility and homogeneity distribution are possible then, that the shock-proof improvement effect of a non-foaming layer is large, and cost etc. to HIPS is desirable. Being able to use a thing well-known as HIPS, the content of a rubber component is usually 1 - 15 % of the weight.

[0031] The thickness of a non-foaming layer (4 5) has 50-300 micrometers desirable further 75-200 micrometers. When the thickness of a non-foaming layer (4 5) is thinner than 50 micrometers, reinforcement, rigidity, thermal resistance, etc. are inferior, and in being thicker than 300 micrometers, it is in the inclination for the moldability of a laminating sheet to be inferior.

[0032] Moreover, this invention is a thing using the cross protection of the sound by the oscillation of a non-foaming layer (4 5) by which the laminating was carried out to the foaming layer (3) which carried out high foaming, and it makes it possible to improve the absorption-of-sound engine performance in the frequency domain which tunes up

resonant frequency and is needed as automobile inner package material by adjusting the rigidity of a non-foaming layer (4 5), and a superintendent officer. Therefore, the superintendent officer of a non-foaming layer and rigidity are set as arbitration by the frequency domain which wants to improve the absorption-of-sound engine performance.

[0033] Furthermore, the laminating of the shock absorbing material (air cap) of the structure which shut up air between the resin films of foam and non-permeability which become a non-foaming layer (4 5) from polyolefine forms, such as nonwoven fabrics, such as felt, polyurethane foam, and polyethylene, polypropylene, etc. may be carried out to a non-foaming layer (4 5) through an adhesives layer for the purpose of broadcloth-izing a resonance vibration peak. Since-izing of the resonance vibration peak can be carried out [ broadcloth ] cheaply, especially the thing done to a non-foaming layer (4 5) for the laminating of the shock absorbing material (air cap) is effective.

[0034] independent [ in a shock-proof amelioration agent, a bulking agent, lubricant, an antioxidant, an antistatic agent, a pigment, a stabilizer, an odor reduction agent, etc. ] if needed, when forming a non-foaming layer (4 5) -- or two or more sorts may be combined and you may add.

[0035] In case a shock-proof amelioration agent conveys punching processing, laminating sheet, and Plastic solid at the time of fabricating the laminating sheet on which carried out the laminating of the non-foaming layer (4 5) to the foaming layer (3), and it was made to foam the 2nd order as automobile inner package material, it is effective in preventing the crack of a non-foaming layer (4 5) etc. If the effectiveness is demonstrated by mixing to base material resin as a shock-proof amelioration agent, it can be especially used without definition. A shock-proof amelioration agent may be the component which can demonstrate the shock-proof amelioration effectiveness introduced into thermoplastics by denaturation by the polymerization, for example, also when mixing what contains a shock-proof amelioration component like HIPS and using it for a non-foaming layer, it can give shock resistance to a non-foaming layer (4 5).

[0036] A hot-melt-adhesive layer (6) is formed in the front face of the vehicle inside non-foaming layer (4) of a foaming laminating sheet. Hot melt adhesive is usually used for pasting up epidermis material (1) on a Plastic solid. As said hot melt adhesive, what uses resin, such as a polyolefine system, a denaturation polyolefine system, a polyurethane system, an ethylene-vinyl acetate copolymerization resin system, a polyamide system, a polyester system, a thermoplastic rubber system, a styrene-butane diene copolymer system, and a styrene-isoprene copolymer system, as a component is

mentioned.

[0037] As an example of epidermis material (1), what is used as conventional automobile inner package material can be used. For example, although textile fabrics and a nonwoven fabric are arranged, in these, they are polyethylene terephthalate, polypropylene, a polyamide (nylon), a polyacrylonitrile, and modacryl (for example, the thing of natural raw materials, such as synthetic resin, such as "a money Charon (trademark)" by Kaneka Corp. etc., and wool, cotton, and the thing which combined them suitably are used.). What carried out the laminating of the foaming layer which changes from polyolefine forms, such as polyurethane foam, and polyethylene, polypropylene, to such epidermis material (1) further if needed in the monolayer or the double layer can be used.

#### EXAMPLE

[Example] Although this invention is further explained at a detail based on an example below, thereby, this invention does not receive a limit at all. The resin used for the example and the example of a comparison is shown in a table 1. In addition, each sign about the resin shown in a table 1 is as follows.

[0039]

[A table 1]

	商品名	製造会社	PPE成分 (%)	PS成分 (%)	ゴム成分 (%)	その他
変性PPE樹脂(a)	ノリル EFN4230	日本GE プラスチック㈱	70	30		
PS樹脂(b)	スタイロン GB102	A&M ポリスチレン㈱		100		
SMAA共重合体 樹脂(c)	スタイロン G9001	A&M ポリスチレン㈱		92		メタクリル酸 8
HIPS樹脂(d)	スタイロン H8117	A&M ポリスチレン㈱		87.5	12.5	
耐衝撃性改良剤 (e)	タフブレン 125	A&M ポリスチレン㈱			100	

[The class of resin]

Denaturation PPE : Denaturation polyphenylene ether PS : Polystyrene SMAA copolymer: Styrene-methacrylic acid copolymer HIPS : The assessment approach performed in high impact polystyrene, the example, and the example of a comparison is shown below.

[Expansion ratio] After starting a sample from the general section of automobile inner package material and separating each configuration layer, the consistency df of a

foaming layer is measured according to JIS K 7222, and it is the consistency dp of denaturation PPE system resin. It measured according to JIS K 7112, and asked from the degree type.

Expansion ratio =  $dp/df$  [0040] [Mounting heat resistance test] The automobile head-lining section (cut body) was equipped with automobile inner package material (width-of-face [ of 930mm ] x die length of 1424mm) as shown in drawing 2 , and it fixed so that it might become equivalent to a real vehicle through a sun visor, a room mirror, a room lamp, GANISSHU, and a pillar. In addition, for an assist grip attaching hole and 8, as for a sun visor stop mounting hole and 10, a sun visor attaching hole and 9 are [ seven in drawing / a room mirror attaching hole and 11 ] tonneau-light attaching holes. Moreover, point of measurement was symmetrically stamped on the front part at intervals of 120mm with the center line of six points and a Plastic solid (a-f in drawing 1 ). The marked line was formed near the point of measurement of the front section, and a vertical distance was measured. Next, after supplying the automobile head-lining section which attached head-lining material in the thermostatic chamber set as 100\*\*1 degree C for 24 hours, the absolute value of the amount of dimensional changes of the perpendicular direction of the point of measurement stamped on the Plastic solid front section was measured, and the maximum of a-f was recorded. in addition, the max entered in a table 3 -- a variation rate -- an amount is the value which measured plus (+) and the vertical hanging-down direction for the direction of a vertical curvature riser as minus (-).

[0041] As criteria of a judgment, the following criteria were used in consideration of the practicability as automobile inner package material.

**耐熱変位量**      ○ ・ ・ ± 2 . 0 mm以下  
                         × ・ ・ ± 2 . 0 mm以上

[Absorption-of-sound nature] The test piece was cut down from the general section of automobile inner package material, and measurement of the normal incidence sound absorption coefficient by JIS-A -1405 estimated. In addition, in order to bring close to the mounting condition to an automobile, 20mm of back air spaces was prepared, and incidence of the sound was carried out from the epidermis material side.

[Permeability] The test piece was cut down from the general section of automobile inner package material, and measurement of the quantity of airflow by JIS-L -1004 estimated. As criteria of a judgment, the following criteria were used in consideration

of the practicability as automobile inner package material.

通気度 ○・・ 通気度  $0.01 \text{ cc/cm}^2 \text{ sec}$  以下

×・・ 通気度  $0.01 \text{ cc/cm}^2 \text{ sec}$  以上

## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the important section enlarged section explanatory view of the automobile inner package material concerning this invention.

[Drawing 2] It is the flat-surface explanatory view showing an example of the automobile inner package material which performed trimming processing concerning this invention.

[Drawing 3] It is as a result of [ of the normal incidence sound absorption coefficient which prepared 20mm of back air spaces of the automobile inner package material of the examples 1-3 concerning this invention ] measurement.

[Drawing 4] It is as a result of [ of the normal incidence sound absorption coefficient which prepared 20mm of back air spaces of the automobile inner package material of the examples 4-5 concerning this invention ] measurement.

[Drawing 5] It is as a result of [ of the normal incidence sound absorption coefficient which prepared 20mm of back air spaces of the automobile inner package material of the examples 1-4 of a comparison concerning this invention ] measurement.

[Description of Notations]

- 1: Epidermis material
- 2: Foaming layered product
- 3: Foaming layer
- 4: Vehicle inside non-foaming layer
- 5: Vehicle outside non-foaming layer
- 6: Hot-melt-adhesive layer
- 7: Assist grip attaching hole
- 8: Sun visor attaching hole
- 9: Sun visor stop attaching hole
- 10: Room mirror attaching hole
- 11: Tonneau-light attaching hole